奇美電子 CHIMEI INNOLUX

PRODUCT SPECIFICATION

☐ Tentative Specification
■ Preliminary Specification
☐ Approval Specification

MODEL NO.: V315HH6
SUFFIX: LS1

Customer:

APPROVED BY **SIGNATURE**

Name / Title _____ _____

Note

Please return 1 copy for your confirmation with your signature and comments.

Approved By	Checked By	Prepared By
Chao-Chun Chung	Josh Chi	Samuel Huang

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REVISION HISTORY

Version	Date	Page(New)	Section	Description
Ver. 1.0	17 Nov., 2010	All	All	The preliminary specification was first issued.
1.1	18 Nov., 2010	11	3.2.1	Note(1): IL: 120 mA → 130 mA
		11	3.2.2	Revise converter 2D mode power consumption: Typ: 45 → (50) Max: 51.8 → (57.5) Revise converter 2D mode input current: 2.08 → (2.04) Revise input inrush current, 3D mode: 9.5 → (6.67), IL: 3*typ → 2*typ Note(3): Specify for 2D mode duration
		12		Revise note(6) test condition drawing

1. GENERAL DESCRIPTION

1.1 OVERVIEW

V315HH6-LS1 is a 31.5" TFT Liquid Crystal Display module with LED Backlight unit and 4ch-LVDS interface. This module supports 1920 x 1080 Full HDTV format and can display 16.7M colors (8-bit). The converter module for backlight is built-in.

1.2 FEATURES

- High brightness (400 nits)
- High contrast ratio (1000 :1)
- Fast response time (3ms)
- High color saturation (NTSC 72%)
- Full HDTV (1920 x 1080 pixels) resolution, true HDTV format
- DE (Data Enable) only mode
- LVDS (Low Voltage Differential Signaling) interface
- Optimized response time for 120 Hz frame rate
- Viewing Angle : 160°(H)/150°(V) (CR>10) TN Technology

1.3 APPLICATION

- TFT LCD TVs
- Optimized Brightness, Multi-Media Displays

1.4 GENERAL SPECIFICATIONS

Item	Specification	Unit	Note
Active Area	698.4(H) x 392.85(V)	mm	(1)
Bezel Opening Area	705.4(H) x 399.8 (V)	mm	
Driver Element	a-si TFT active matrix	-	-
Pixel Number	1920x R.G.B. x 1080	pixel	-
Pixel Pitch(Sub Pixel)	0.12125 (H) x 0.36375 (V)	mm	-
Pixel Arrangement	RGB vertical stripe	-	-
Power consumption	(65)	Watt	(2)
Display Colors	16.7M	color	-
Display Operation Mode	Transmissive mode / Normally White	-	-
Surface Treatment	Anti-Glare coating (Haze 25%)	-	(3)

Note (1) Please refer to the attached drawings in chapter 9 for more information about the front and back outlines.

Note (2) Please refer sec 3.1 and 3.2 for more information of Power consumption

Note (3) The spec. of the surface treatment is temporarily for this phase. CMI reserves the rights to change this feature.

1.5 MECHANICAL SPECIFICATIONS

Item		Min.	Typ.	Max.	Unit	Note
Module Size	Horizontal (H)	740.4	741.4	742.4	mm	(1)
	Vertical (V)	434.8	435.8	436.8	mm	(1)
	Depth (D)	19.55	20.55	21.55	mm	(2)
	Depth (D)	34.9	35.9	36.9	mm	(3)
Weight			TBD			-

Note (1) Please refer to the attached drawings for more information of front and back outline dimensions.

Note (2) Module Depth is between bezel to T-CON cover.

Note (3) Module Depth is between bezel to Converter cover.

2. ABSOLUTE MAXIMUM RATINGS

2.1 ABSOLUTE RATINGS OF ENVIRONMENT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Storage Temperature	TST	-20	+60	ºC	(1)
Operating Ambient Temperature	TOP	0	50	ºC	(1), (2)
Shock (Non-Operating)	SNOP	-	50	G	(3), (5)
Vibration (Non-Operating)	VNOP	-	1.0	G	(4), (5)

Note (1) Temperature and relative humidity range is shown in the figure below.

(a) 90 %RH Max. (Ta ≦ 40 ºC).

(b) Wet-bulb temperature should be 39 ºC Max. (Ta > 40 ºC).

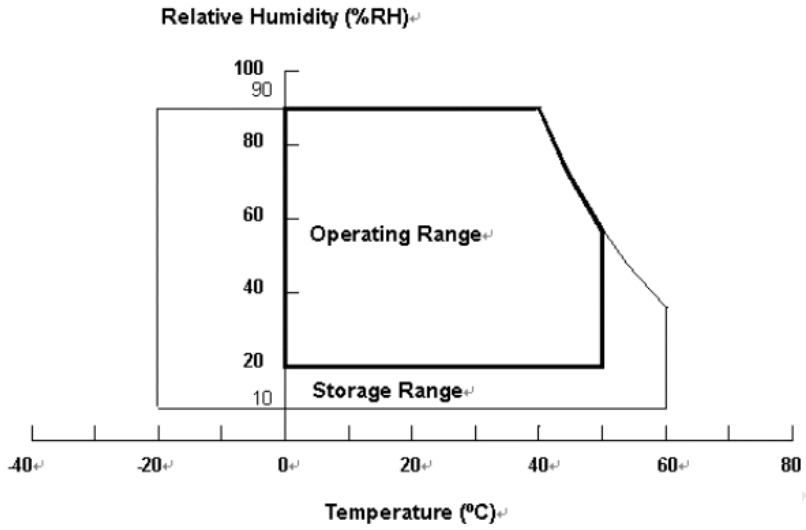
(c) No condensation.

Note (2) The maximum operating temperature is based on the test condition that the surface temperature of display area is less than or equal to 65 ºC with LCD module alone in a temperature controlled chamber. Thermal management should be considered in final product design to prevent the surface temperature of display area from being over 65 ºC. The range of operating temperature may degrade in case of improper thermal management in final product design.

Note (3) 11 ms, half sine wave, 1 time for ± X, ± Y, ± Z.

Note (4) 10 ~ 200 Hz, 10 min, 1 time each X, Y, Z.

Note (5) At testing Vibration and Shock, the fixture in holding the module has to be hard and rigid enough so that the module would not be twisted or bent by the fixture.



2.2 PACKAGE STORAGE

When storing modules as spares for a long time, the following precaution is necessary.

(a) Do not leave the module in high temperature, and high humidity for a long time, It is highly recommended to store the module with temperature from 0 to 35 ℃ at normal humidity without condensation.

(b) The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

2.3 ELECTRICAL ABSOLUTE RATINGS

2.3.1 TFT LCD MODULE

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Power Supply Voltage	VCC	-0.3	13.5	V	(1)
Logic Input Voltage	VIN	-0.3	3.6	V	

2.3.2 BACKLIGHT CONVERTER UNIT

Item	Symbol	Value		Unit	Note
		Min.	Max.		
Light bar Voltage	VW	–	60	V_{DC}	3D Mode
Power Supply Voltage	VBL	0	30	V	(1)
Control Signal Level	–	-0.3	7	V	(1), (3)

Note (1) Permanent damage to the device may occur if maximum values are exceeded. Function operation should be restricted to the conditions described under Normal Operating Conditions.

Note (2) No moisture condensation or freezing.

Note (3) The control signals include On/Off Control & External PWM Control.

3. ELECTRICAL CHARACTERISTICS

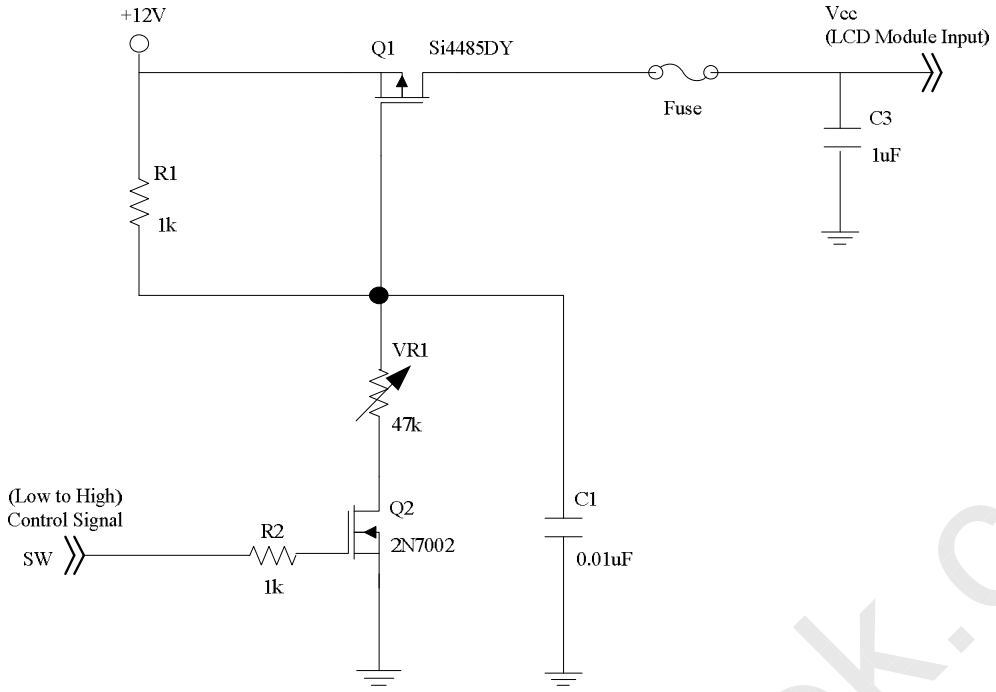
3.1 TFT LCD MODULE

(Ta = 25 ± 2 ºC)

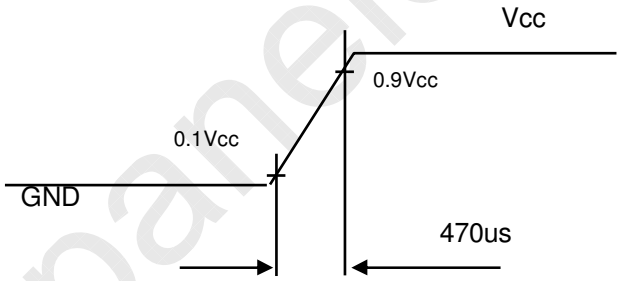
Parameter		Symbol	Value			Unit	Note
			Min.	Typ.	Max.		
Power Supply Voltage		V_{CC}	10.8	12	(13.2)	V	(1)
Rush Current		I_{RUSH}	—	—	(3)	A	(2)
Power Consumption	White Pattern	—	—	(6.6)	(7.8)	W	(3)
	Horizontal Stripe	—	—	(15)	(17.4)	W	
	Black Pattern	—	—	(15)	(17.4)	W	
Power Supply Current	White Pattern	—	—	(0.55)	(0.65)	A	
	Horizontal Stripe	—	—	(1.25)	(1.45)	A	
	Black Pattern	—	—	(1.25)	(1.45)	A	
LVDS interface	Differential Input High Threshold Voltage	V_{LVTH}	+100	—	—	mV	(4)
	Differential Input Low Threshold Voltage	V_{LVTL}	—	—	-100	mV	
	Common Input Voltage	V_{CM}	1.0	1.2	1.4	V	
	Differential input voltage (single-end)	$\|V_{ID}\|$	200	—	600	mV	
	Terminating Resistor	R_T	—	100	—	ohm	
CMIS interface	Input High Threshold Voltage	V_{IH}	2.7	—	3.3	V	
	Input Low Threshold Voltage	V_{IL}	0	—	0.7	V	

Note (1) The module should be always operated within the above ranges.

Note (2) Measurement condition:



Vcc rising time is 470us



Note (3) The specified power consumption and power supply current is under the conditions at Vcc = 12 V, Ta = 25 ± 2 ºC, f_v = 120 Hz, where as a power dissipation check pattern below is displayed.

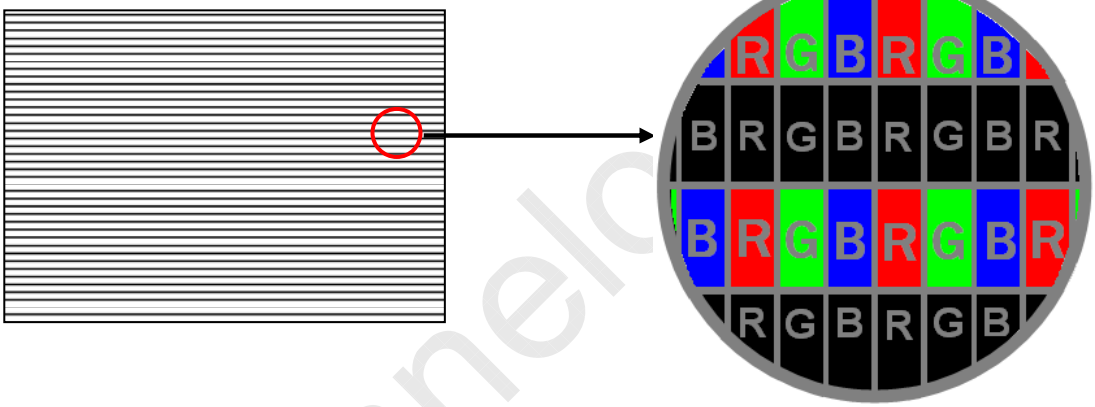
a. White Pattern

Active Area

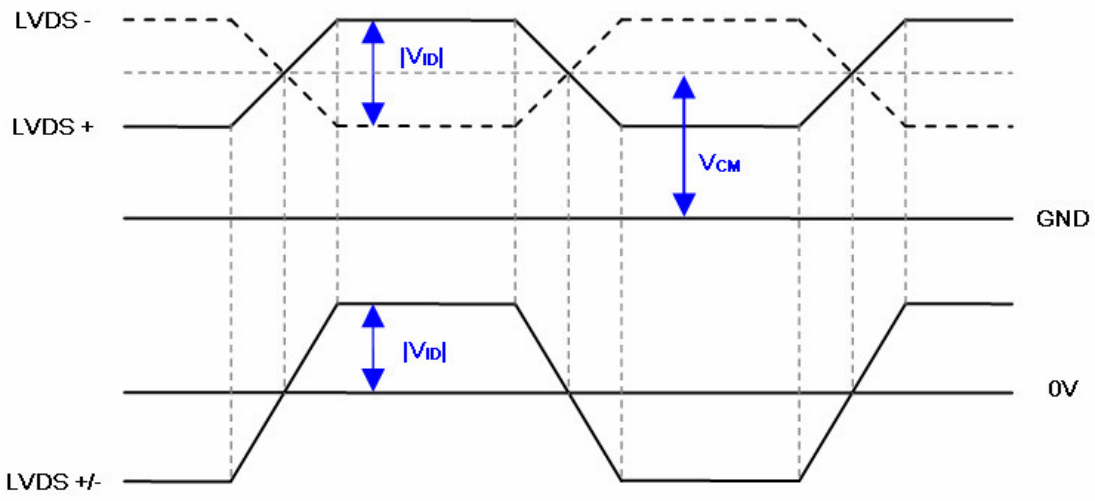
b. Black Pattern

Active Area

c. Horizontal Pattern



Note (4) The LVDS input characteristics are as follows:



3.2 BACKLIGHT CONNECTOR PIN CONFIGURATION

3.2.1 LED LIGHT BAR CHARACTERISTICS (Ta = 25 ± 2 ºC)

The backlight unit contains 2 pcs of light bars

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Total Current (8 String)	If	-	1040	1102.4	mA	
One String Current	$I_{L(2D)}$	-	130	137.8	mA	
	$I_{L(3D)}$	-	260	275.6	mApeak	3D ENA=ON
One String Voltage	V_W	39	-	45.5	V_{DC}	I_L =130mA
One String Voltage Variation	$\triangle V_W$	-	-	2	V	
Life time	-	30,000	-	-	Hrs	(1)

Note (1) The lifetime is defined as the time which luminance of the LED decays to 50% compared to the initial value, Operating condition: Continuous operating at Ta = 25±2℃, I_L =130mA.

3.2.2 CONVERTER CHARACTERISTICS (Ta = 25 ± 2 ºC)

Parameter	Symbol	Value			Unit	Note
		Min.	Typ.	Max.		
Power Consumption	$P_{BL(2D)}$	-	(50)	(57.5)	W	(1), (2) IL = 130 mA
	$P_{BL(3D)}$	-	(21.6)	(24.8)	W	(1), (2) IL=2*typ.
Converter Input Voltage	VBL	22.8	24.0	25.2	VDC	
Converter Input Current	$I_{BL(2D)}$	-	(2.08)	(2.4)	A	Non Dimming
	$I_{BL(3D)}$	-	(0.9)	(1.03)	A	
Input Inrush Current	$I_{R(2D)}$	-	-	(3.24)	Apeak	V_{BL}=22.8V,(IL=typ.) (3), (7)
	$I_{R(3D)}$	-	-	(6.67)	Apeak	V_{BL}=22.8V,(IL=2*typ.) (3), (6)
Dimming Frequency	FB	150	160	170	Hz	(5)
Minimum Duty Ratio	DMIN	5	10	-	%	(4), (5)

Note (1) The power supply capacity should be higher than the total converter power consumption P_{BL}. Since the pulse width modulation (PWM) mode was applied for backlight dimming, the driving current changed as PWM duty on and off. The transient response of power supply should be considered for the changing loading when converter dimming.

Note (2) The measurement condition of Max. value is based on 42" backlight unit under input voltage 24V, average LED current 137.8mA at 2D Mode (LED current 275.6 mA_{peak} at 3D Mode) and lighting 1 hour later.

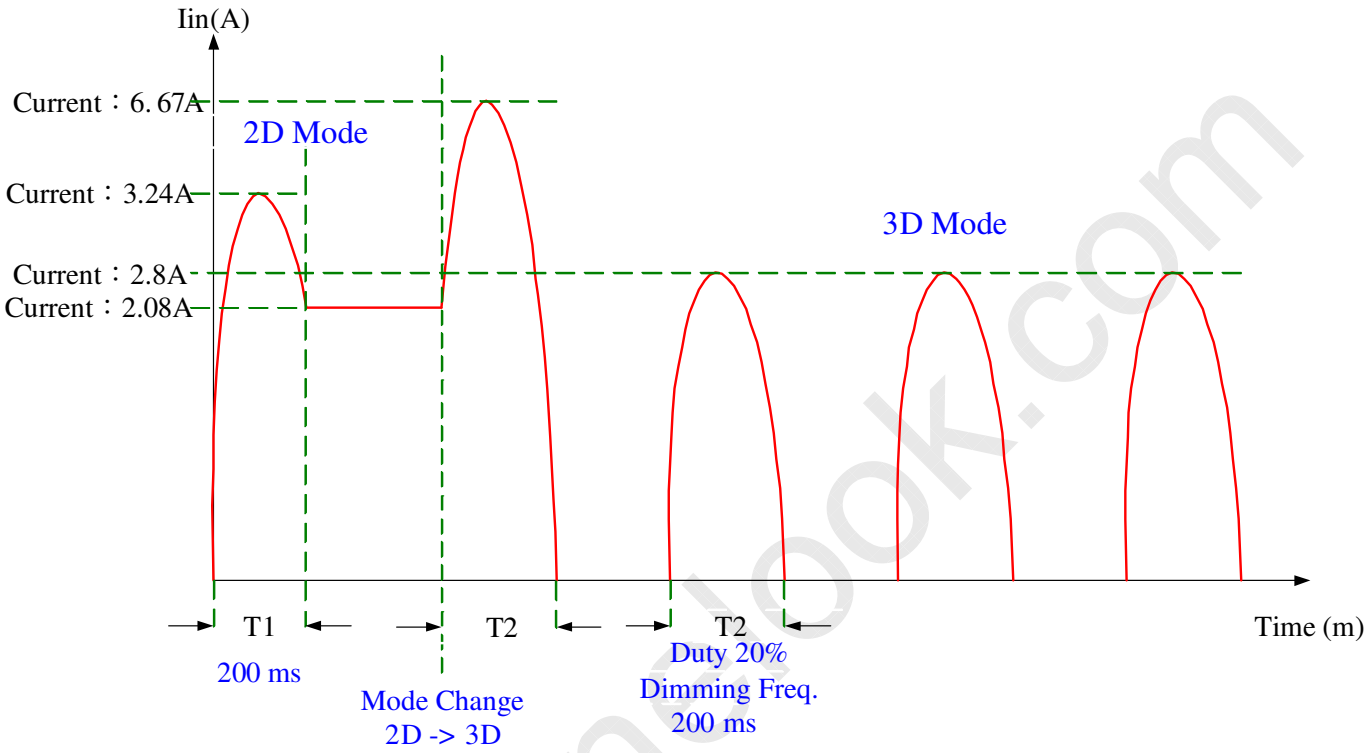
Note (3) The duration of Input Inrush Current is about 30ms for 2D Mode..

Note (4) 5% minimum duty ratio is only valid for electrical operation.

Note (5) FB and DMIN are available only at 2D Mode.

Note (6) Below diagram is only for power supply design reference.

Test Condition: V_{BL}=22.8V, IL=130mA at 2D Mode/ IL=(260)mApeak at 3D Mode



3.2.3 CONVERTER INTERFACE CHARACTERISTICS

Parameter		Symbol	Test Condition	Value			Unit	Note	
				Min.	Typ.	Max.			
On/Off Control Voltage	ON	VBLON	—	2.0	—	5.0	V		
	OFF		—	0	—	0.8	V		
External PWM Control Voltage	HI	VEPWM	—	2.0	—	5.25	V	Duty on	(5) , (6)
	LO		—	0	—	0.8	V	Duty off	
Error Signal		ERR	—	—	—	—	—	Abnormal: Open collector Normal: GND (4)	
VBL Rising Time		Tr1	—	30	—	—	ms	10%-90%V_{BL}	
Control Signal Rising Time		Tr	—	—	—	100	ms		
Control Signal Falling Time		Tf	—	—	—	100	ms		
PWM Signal Rising Time		TPWMR	—	—	—	50	us	(6)	
PWM Signal Falling Time		TPWMF	—	—	—	50	us	(6)	
Input Impedance		Rin	—	1	—	—	MΩ	E_PWM, BLON	
PWM Delay Time		TPWM	—	100	—	—	ms	(6)	
BLON Delay Time		T_{on}	—	300	—	—	ms		
		T_{on1}	—	300	—	—	ms		
BLON Off Time		Toff	—	300	—	—	ms		

Note (1) The Dimming signal should be valid before backlight turns on by BLON signal. It is inhibited to change the external PWM signal during backlight turn on period.

Note (2) The power sequence and control signal timing are shown in the Fig.1. For a certain reason, the converter has a possibility to be damaged with wrong power sequence and control signal timing.

Note (3) While system is turned ON or OFF, the power sequences must follow as below descriptions:

Turn ON sequence: VBL → PWM signal → BLON

Turn OFF sequence: BLOFF → PWM signal → VBL

Note (4) When converter protective function is triggered, ERR will output open collector status.

Note (5) The EPWM interface that inserts a pull up resistor to 5V in Max Duty (100%), please refers to Fig.2.

Note (6) EPWM is available only at 2D Mode.

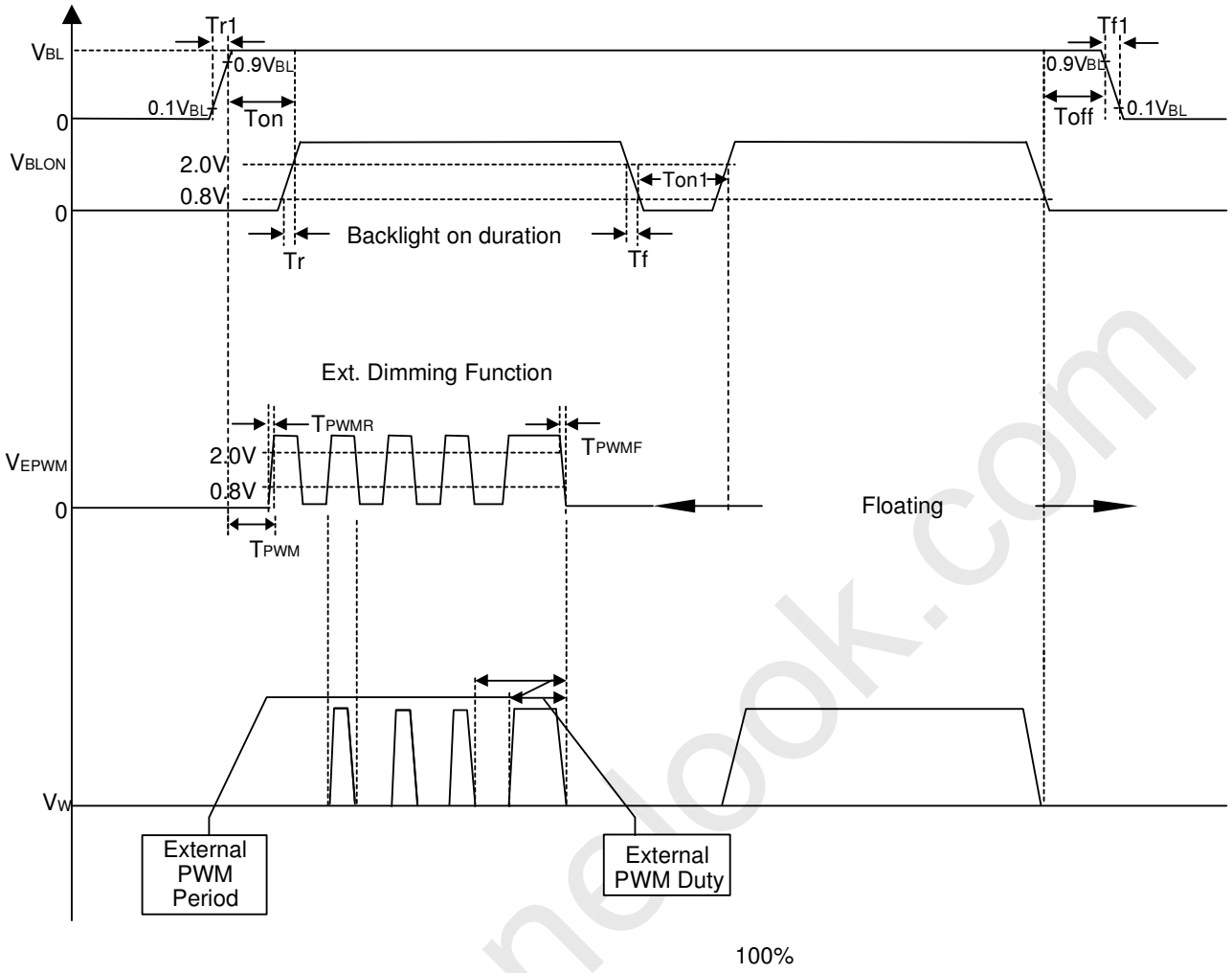


Fig. 1

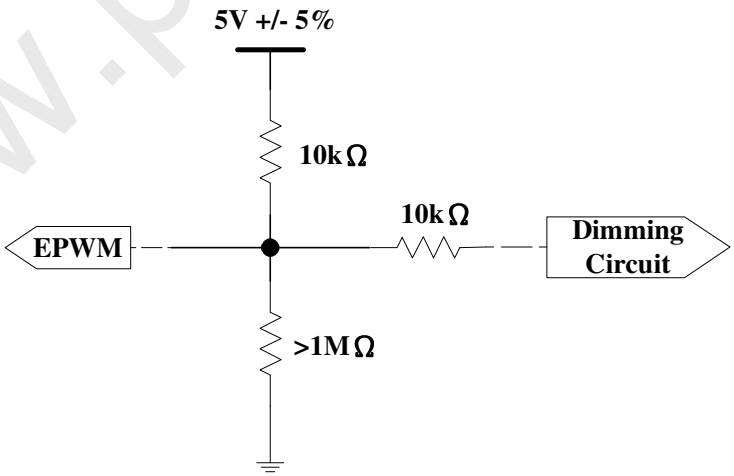
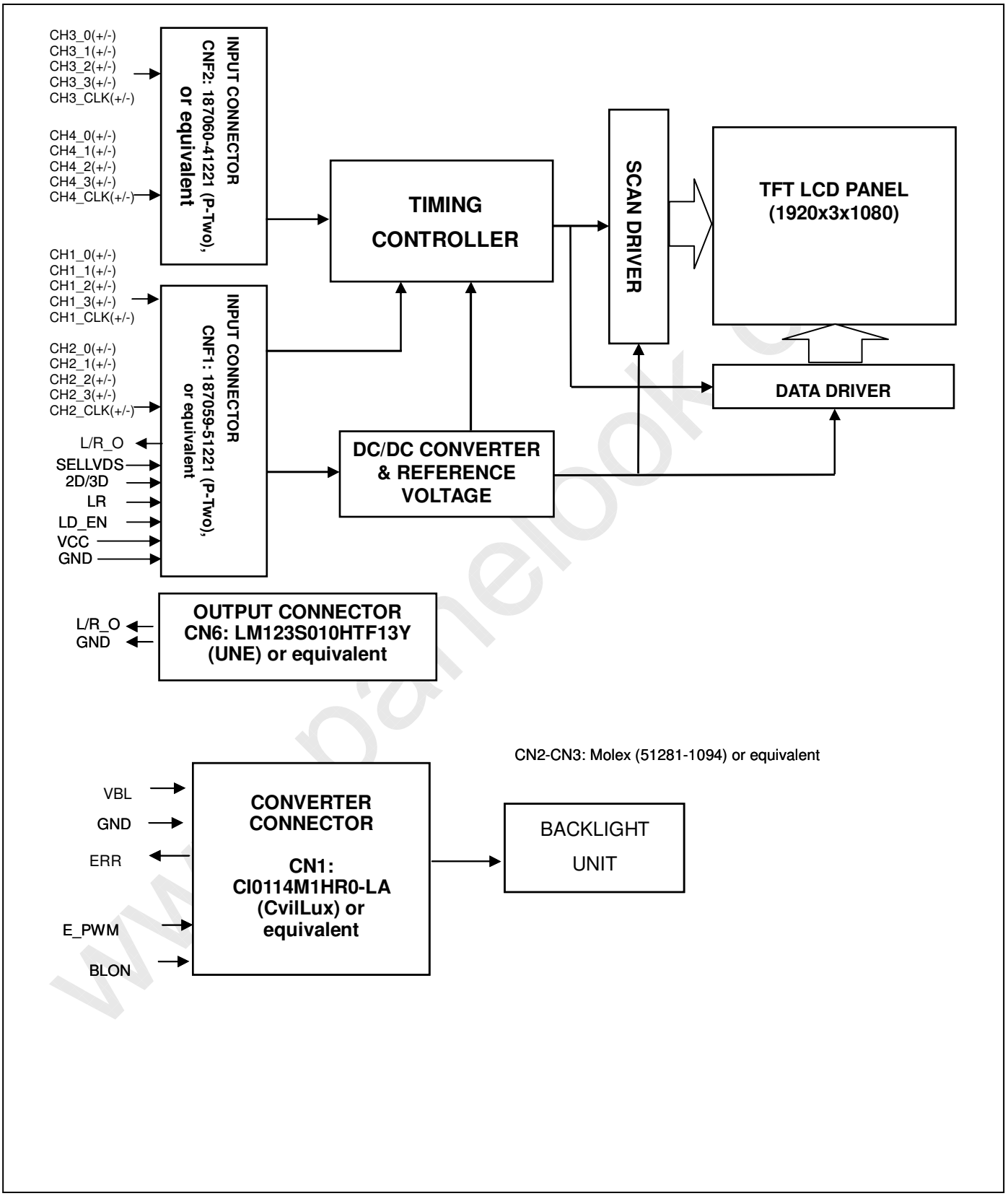


Fig. 2

4. BLOCK DIAGRAM OF INTERFACE

4.1 TFT LCD MODULE



5. INPUT TERMINAL PIN ASSIGNMENT

5.1 TFT LCD Module Input

CNF1 Connector Pin Assignment: (187059-51221 (P-Two) or equivalent)

Pin	Name	Description	Note
1	N.C.	No Connection	(1)
2	N.C.	No Connection	
3	N.C.	No Connection	
4	N.C.	No Connection	
5	L/R_O	Output signal for Left Right Glasses control	(8)
6	N.C.	No Connection	(1)
7	SELLVDS	LVDS Data Format Selection	(2)(6)
8	N.C.	No Connection	(1)
9	N.C.	No Connection	
10	N.C.	No Connection	
11	GND	Ground	
12	CH1[0]-	First pixel Negative LVDS differential data input. Pair 0	
13	CH1[0]+	First pixel Positive LVDS differential data input. Pair 0	
14	CH1[1]-	First pixel Negative LVDS differential data input. Pair 1	
15	CH1[1]+	First pixel Positive LVDS differential data input. Pair 1	
16	CH1[2]-	First pixel Negative LVDS differential data input. Pair 2	
17	CH1[2]+	First pixel Positive LVDS differential data input. Pair 2	
18	GND	Ground	
19	CH1CLK-	First pixel Negative LVDS differential clock input.	
20	CH1CLK+	First pixel Positive LVDS differential clock input.	
21	GND	Ground	
22	CH1[3]-	First pixel Negative LVDS differential data input. Pair 3	
23	CH1[3]+	First pixel Positive LVDS differential data input. Pair 3	
24	N.C.	No Connection	(1)
25	N.C.	No Connection	
26	2D/3D	Input signal for 2D/3D Mode Selection	(3)(6)
27	L/R	Input signal for Left Right eye frame synchronous	(4)(6)
28	CH2[0]-	Second pixel Negative LVDS differential data input. Pair 0	

29	CH2[0]+	Second pixel Positive LVDS differential data input. Pair 0	
30	CH2[1]-	Second pixel Negative LVDS differential data input. Pair 1	
31	CH2[1]+	Second pixel Positive LVDS differential data input. Pair 1	
32	CH2[2]-	Second pixel Negative LVDS differential data input. Pair 2	
33	CH2[2]+	Second pixel Positive LVDS differential data input. Pair 2	
34	GND	Ground	
35	CH2CLK-	Second pixel Negative LVDS differential clock input.	
36	CH2CLK+	Second pixel Positive LVDS differential clock input.	
37	GND	Ground	
38	CH2[3]-	Second pixel Negative LVDS differential data input. Pair 3	
39	CH2[3]+	Second pixel Positive LVDS differential data input. Pair 3	
40	N.C.	No Connection	(1)
41	N.C.	No Connection	
42	LD_EN	Local Dimming Enable	(5)(6)
43	N.C.	No Connection	(1)
44	GND	Ground	
45	GND	Ground	
46	GND	Ground	
47	N.C.	No Connection	(1)
48	VCC	+12V power supply	
49	VCC	+12V power supply	
50	VCC	+12V power supply	
51	VCC	+12V power supply	

CNF2 Connector Pin Assignment (187060-41221 (P-Two) or equivalent)

Pin	Name	Description	Note
1	N.C.	No Connection	(1)
2	N.C.	No Connection	
3	N.C.	No Connection	
4	N.C.	No Connection	
5	N.C.	No Connection	
6	N.C.	No Connection	
7	N.C.	No Connection	
8	N.C.	No Connection	
9	GND	Ground	
10	CH3[0]-	Third pixel Negative LVDS differential data input. Pair 0	
11	CH3[0]+	Third pixel Positive LVDS differential data input. Pair 0	
12	CH3[1]-	Third pixel Negative LVDS differential data input. Pair 1	
13	CH3[1]+	Third pixel Positive LVDS differential data input. Pair 1	
14	CH3[2]-	Third pixel Negative LVDS differential data input. Pair 2	
15	CH3[2]+	Third pixel Positive LVDS differential data input. Pair 2	
16	GND	Ground	
17	CH3CLK-	Third pixel Negative LVDS differential clock input.	
18	CH3CLK+	Third pixel Positive LVDS differential clock input.	
19	GND	Ground	
20	CH3[3]-	Third pixel Negative LVDS differential data input. Pair 3	
21	CH3[3]+	Third pixel Positive LVDS differential data input. Pair 3	
22	N.C.	No Connection	
23	N.C.	No Connection	
24	GND	Ground	
25	GND	Ground	
26	CH4[0]-	Fourth pixel Negative LVDS differential data input. Pair 0	
27	CH4[0]+	Fourth pixel Positive LVDS differential data input. Pair 0	
28	CH4[1]-	Fourth pixel Negative LVDS differential data input. Pair 1	
29	CH4[1]+	Fourth pixel Positive LVDS differential data input. Pair 1	

30	CH4[2]-	Fourth pixel Negative LVDS differential data input. Pair 2	
31	CH4[2]+	Fourth pixel Positive LVDS differential data input. Pair 2	
32	GND	Ground	
33	CH4CLK-	Fourth pixel Negative LVDS differential clock input.	
34	CH4CLK+	Fourth pixel Positive LVDS differential clock input.	
35	GND	Ground	
36	CH4[3]-	Fourth pixel Negative LVDS differential data input. Pair 3	
37	CH4[3]+	Fourth pixel Positive LVDS differential data input. Pair 3	
38	N.C.	No Connection	
39	N.C.	No Connection	
40	GND	Ground	
41	GND	Ground	

CN6 Connector Pin Assignment (LM123S010HTF13Y (UNE) or equivalent)

1	N.C.	No Connection	(1)
2	N.C.	No Connection	
3	N.C.	No Connection	
4	GND	Ground	
5	N.C.	No Connection	(1)
6	L/R_O	Output signal for Left Right Glasses control	(8)
7	N.C.	No Connection	(1)
8	N.C.	No Connection	
9	N.C.	No Connection	
10	N.C.	No Connection	

Note (1) Reserved for internal use. Please leave it open.

Note (2) LVDS format selection.

L= Connect to GND, H=Connect to +3.3V

SELLVDS	Note
L	JEDIA Format
H or Open	VESA Format

Note (3) 2D/3D mode selection.

L= Connect to GND or Open, H=Connect to +3.3V

2D/3D	Note

L or Open	2D Mode
H	3D Mode

Note (4) Left Right synchronous signal for glasses.

V_{IL}=0~0.8, V_{IH}=2.0~3.3

LR	Note
L	Right synchronous signal
H	Left synchronous signal

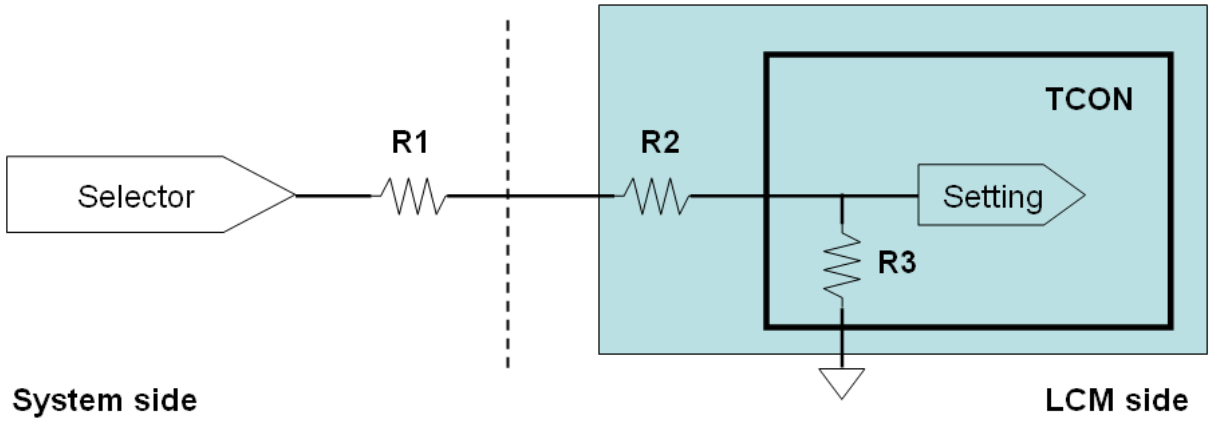
Note (5) Local dimming enable selection.

L= Connect to GND or Open, H=Connect to +3.3V

LD_EN	Note
L or Open	Local Dimming Disable
H	Local Dimming Enable

Note (6) SELLVDS, 2D/3D, LR and LD_EN signal pin connected to the LCM side has the following diagram.

R1 in the system side should be less than 1K Ohm. (R1 < 1K Ohm)



System side: R1 < 1K

Note (7) LVDS 4-port Data Mapping

Port	Channel of LVDS	Data Stream
1st Port	First Pixel	1, 5, 9, ……1913, 1917
2nd Port	Second Pixel	2, 6, 10, ….1914, 1918
3rd Port	Third Pixel	3, 7, 11, ….1915, 1919
4th Port	Fourth Pixel	4, 8, 12, ….1916, 1920

Note (8) The definition of L/R_O signal as follows

L= 0V , H= +3.3V

L/R_O	Note
L	Right glass turn on
H	Left glass turn on

5.2 BACKLIGHT UNIT

The pin configuration for the housing and the leader wire is shown in the table below.

N2-CN3 (Housing): 51281-1094 (Molex) or equivalent

Pin №	Symbol	Feature
1	VLED+	Positive of LED String
2	VLED+	
3	NC	NC
4	NC	
5	NC	
6	NC	
7	VLED-	Negative of LED String
8	VLED-	
9	VLED-	
10	VLED-	

5.3 CONVERTER UNIT

CN1(Header): CI0114M1HR0-LA (CVILUX) or equivalent

Pin №	Symbol	Feature
1	VBL	+24V
2		
3		
4		
5		
6	GND	GND
7		
8		
9		
10		
11	ERR	Normal (GND) Abnormal(Open collector)
12	BLON	BL ON/OFF
13	NC	NC
14	E_PWM	External PWM Control

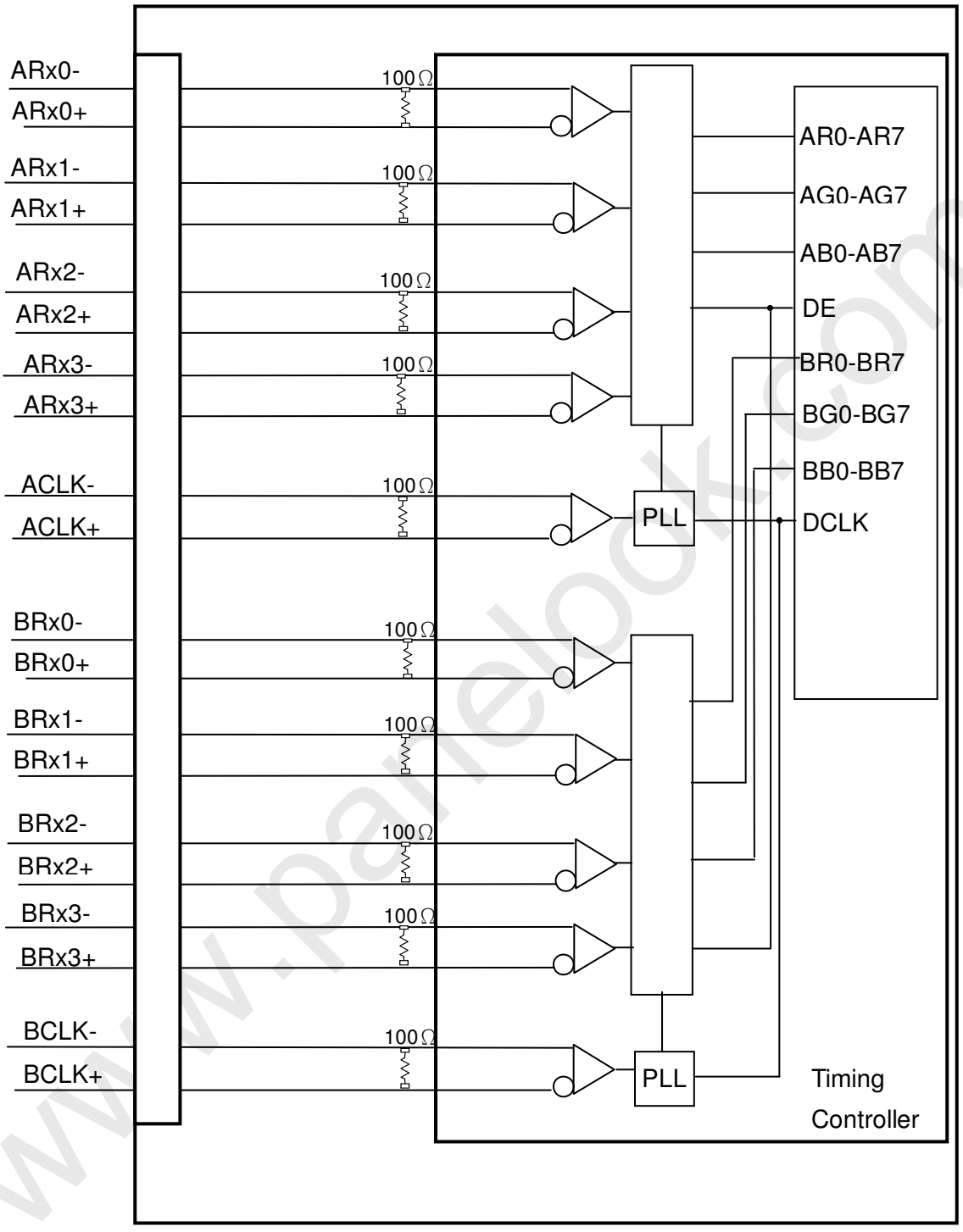
Notice

1. If Pin14 is open, E_PWM is 100% duty.

CN2 ~ CN3 : 51281-1094 (Molex) or equivalent

Pin №	Symbol	Feature
1	VLED+	Positive of LED String
2	VLED+	
3	NC	NC
4	NC	
5	NC	
6	NC	
7	VLED-	Negative of LED String
8	VLED-	
9	VLED-	
10	VLED-	

5.4 BLOCK DIAGRAM OF INTERFACE



AR0~AR7	First pixel R data	BR0~BR7	Second pixel R data
AG0~AG7	First pixel G data	BG0~BG7	Second pixel G data
AB0~AB7	First pixel B data	BB0~BB7	Second pixel B data
		DE	Data enable signal
		DCLK	Data clock signal

The third and fourth pixel are followed the same rules.

CR0~CR7	Third pixel R data	DR0~DR7	Fourth pixel R data
CG0~CG7	Third pixel G data	DG0~DG7	Fourth pixel G data
CB0~CB7	Third pixel B data	DB0~DB7	Fourth pixel B data
		DE	Data enable signal
		DCLK	Data clock signal

Note (1) A ~ D channel are first, second, third and fourth pixel respectively.

Note (2) The system must have the transmitter to drive the module.

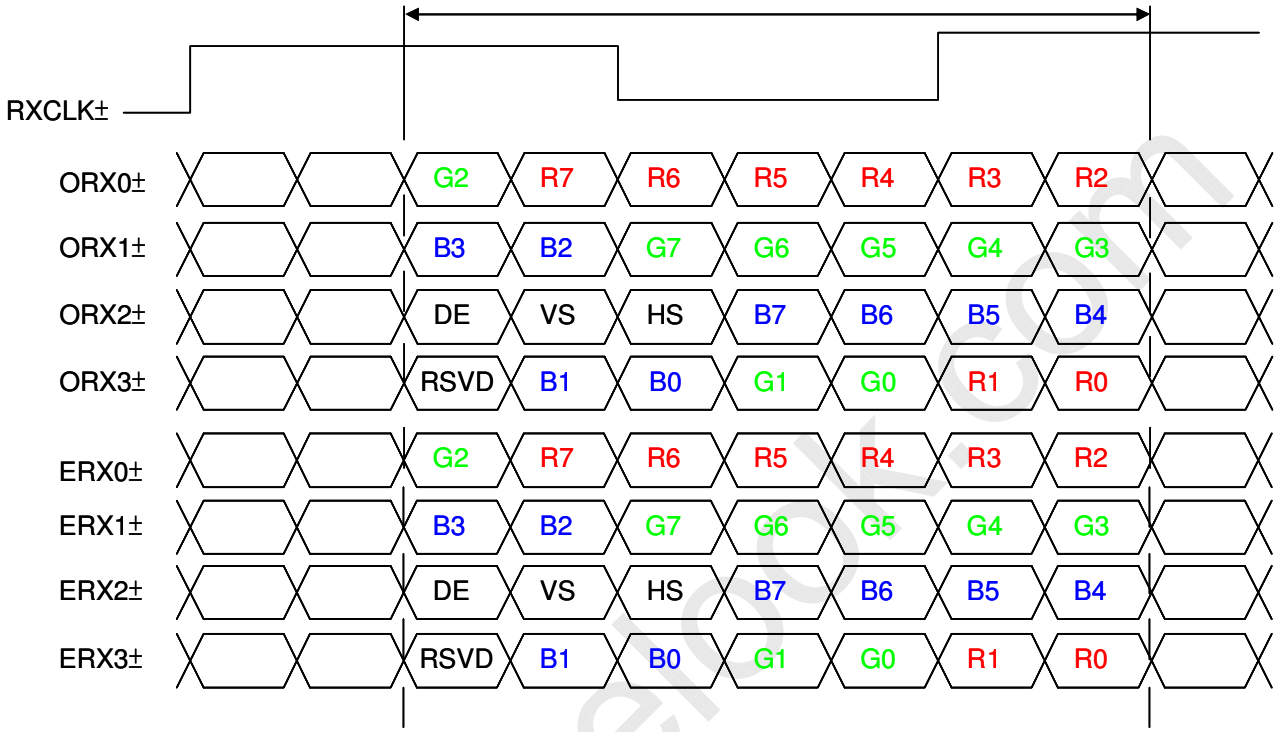
Note (3) LVDS cable impedance shall be 50 ohms per signal line or about 100 ohms per twist-pair line when it is used differentially.

5.5 LVDS INTERFACE

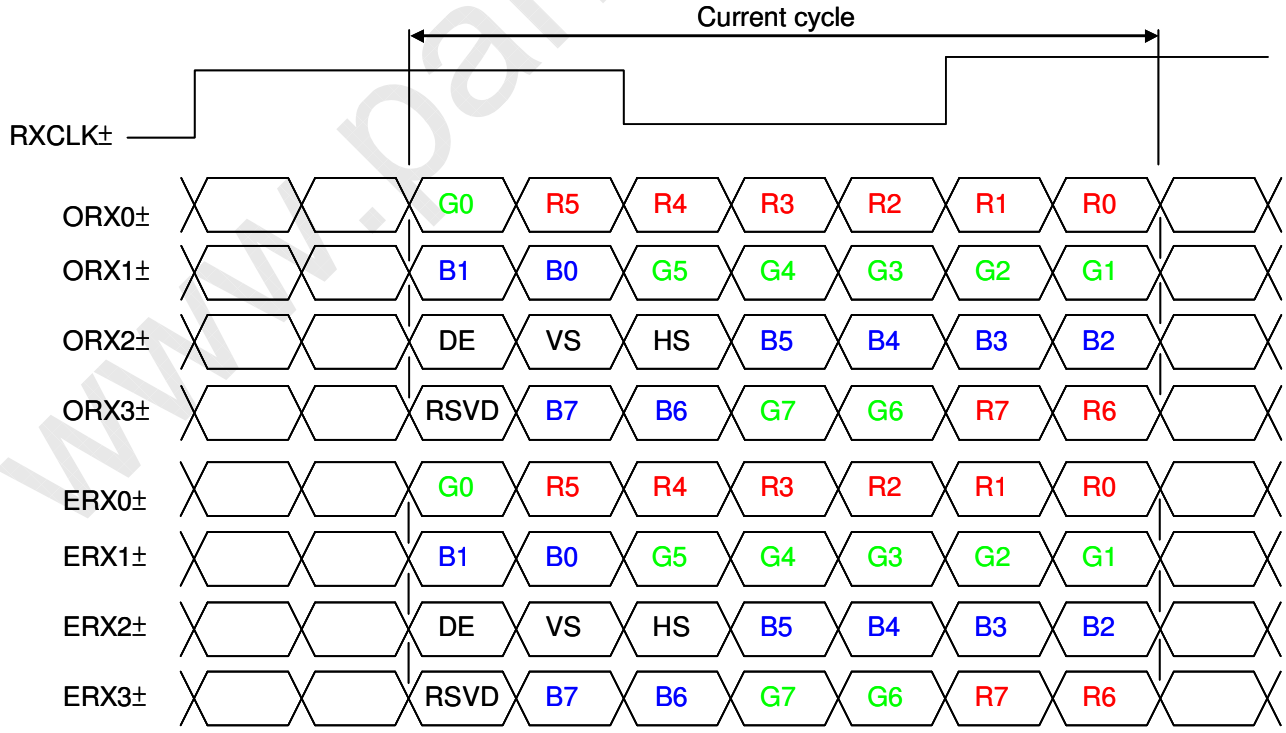
JEIDA Format : SELLVDS = L

VESA Format : SELLVDS = H or Open

JEDIA Format



VESA Format



R0~R7: Pixel R Data (7; MSB, 0; LSB)

G0~G7: Pixel G Data (7; MSB, 0; LSB)

B0~B7: Pixel B Data (7; MSB, 0; LSB)

DE : Data enable signal

DCLK : Data clock signal

Notes (1) RSVD (reserved) pins on the transmitter shall be “H” or “L”.

5.6 COLOR DATA INPUT ASSIGNMENT

The brightness of each primary color (red, green and blue) is based on the 8-bit gray scale data input for the color. The higher the binary input, the brighter the color. The table below provides the assignment of the color versus data input.

Color		Data Signal																							
		Red								Green								Blue							
		R7	R6	R5	R4	R3	R2	R1	R0	G7	G6	G5	G4	G3	G2	G1	G0	B7	B6	B5	B4	B3	B2	B1	B0
Basic Colors	Black	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	Blue	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Cyan	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
	Magenta	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1
	Yellow	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
	White	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Gray Scale Of Red	Red (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (1)	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (2)	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Red (253)	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (254)	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Red (255)	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gray Scale Of Green	Green (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Green (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Green (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Green (253)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1	0	0	0	0	0	0	0	0
	Green (254)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0
	Green (255)	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0
Gray Scale Of Blue	Blue (0) / Dark	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Blue (1)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
	Blue (2)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:	:
	Blue (253)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	0	1
	Blue (254)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	0
	Blue (255)	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1	1	1	1	1

Note (1) 0: Low Level Voltage, 1: High Level Voltage

6. INTERFACE TIMING

6.1 INPUT SIGNAL TIMING SPECIFICATIONS

(Ta = 25 ± 2 ºC)

The input signal timing specifications are shown as the following table and timing diagram.

Signal	Item	Symbol	Min.	Typ.	Max.	Unit	Note
LVDS Receiver Clock	Frequency	F_{clkin} (=1/TC)	60	74.25	96.012	MHz	
	Input cycle to cycle jitter	T_{rcl}	-	-	200	ps	(3)
	Spread spectrum modulation range	F_{clkin_mod}	F_{clkin}-2%	-	F_{clkin}+2%	MHz	(4)
	Spread spectrum modulation frequency	F_{SSM}	-	-	200	KHz	
LVDS Receiver Data	Setup Time	Tlvsu	600	-	-	ps	(5)
	Hold Time	Tlvhd	600	-	-	ps	

6.1.1 Timing spec for Frame Rate(F_{r5} = 100Hz)

Vertical Active Display Term	2D Mode	Total	Tv	1090	1125	1480	Th	Tv=Tvd+Tvb
		Display	Tvd	1080	1080	1080	Th	—
		Blank	Tvb	10	45	400	Th	—
	3D Mode	Total	Tv	1524			Th	(6)
		Display	Tvd	1080			Th	
		Blank	Tvb	444			Th	
Horizontal Active Display Term	2D Mode	Total	Th	520	550	670	Tc	Th=Thd+Thb
		Display	Thd	480	480	480	Tc	—
		Blank	Thb	40	70	190	Tc	—
	3D Mode	Total	Th	525			Tc	Th=Thd+Thb
		Display	Thd	480			Tc	—
		Blank	Thb	45			Tc	—

6.1.2 Timing spec for Frame Rate(F_{r6} = 120Hz)

Vertical Active Display Term	2D Mode	Total	Tv	1090	1125	1480	Th	Tv=Tvd+Tvb
		Display	Tvd	1080	1080	1080	Th	—
		Blank	Tvb	10	45	400	Th	—
	3D Mode	Total	Tv	1524			Th	(6)
		Display	Tvd	1080			Th	
		Blank	Tvb	444			Th	
Horizontal Active Display Term	2D Mode	Total	Th	520	550	670	Tc	Th=Thd+Thb
		Display	Thd	480	480	480	Tc	—
		Blank	Thb	40	70	190	Tc	—
	3D Mode	Total	Th	525			Tc	Th=Thd+Thb
		Display	Thd	480			Tc	—
		Blank	Thb	45			Tc	—

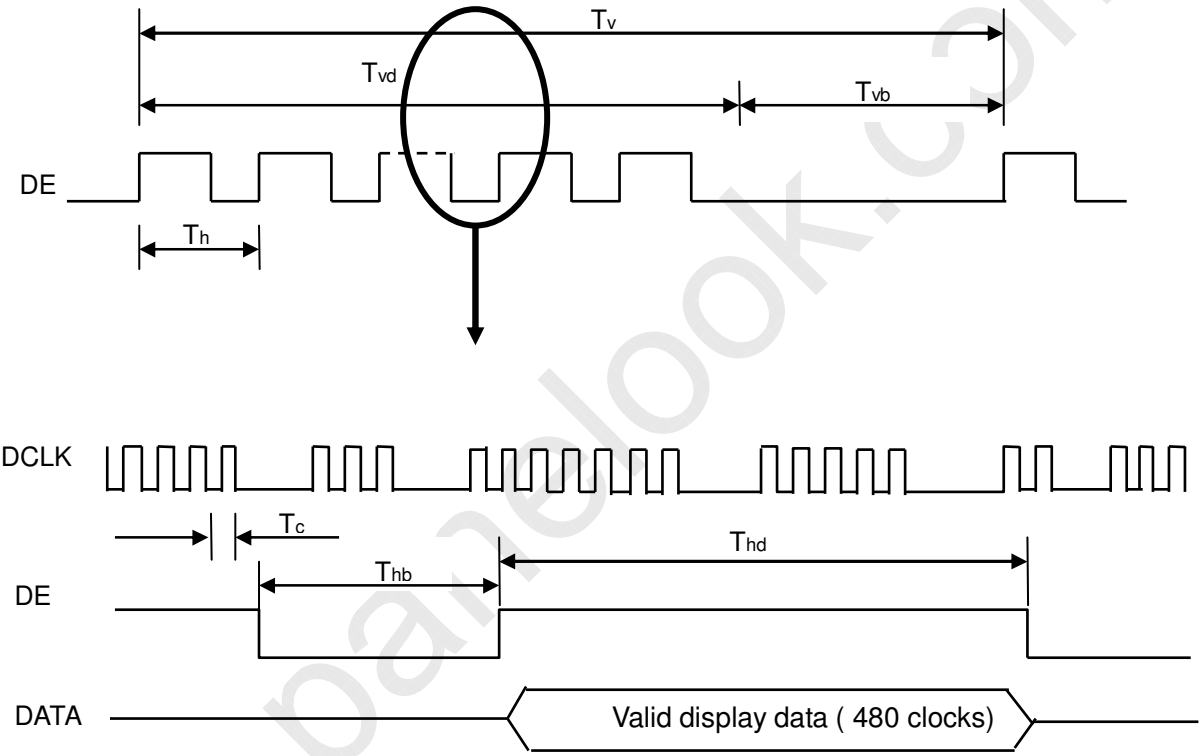
Note (1) Since the module is operated in DE only mode, Hsync and Vsync input signals should be set to low logic level. Otherwise, this module would operate abnormally.

Note (2) Please make sure the range of pixel clock has follow the below equation:

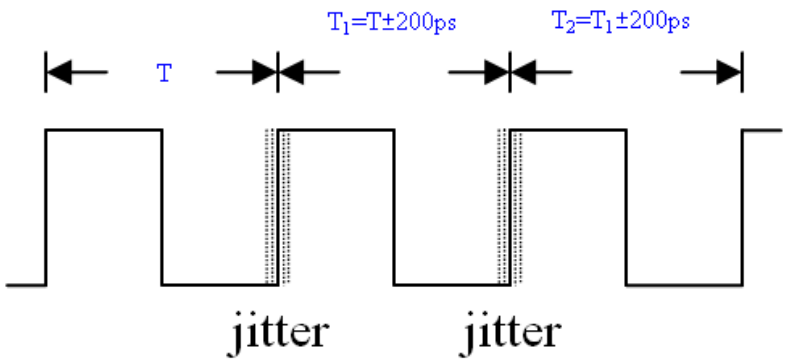
$F_{clkin(max)} \geqq F_{r6} \times Tv \times Th$

$F_{r5} \times Tv \times Th \geqq F_{clkin(min)}$

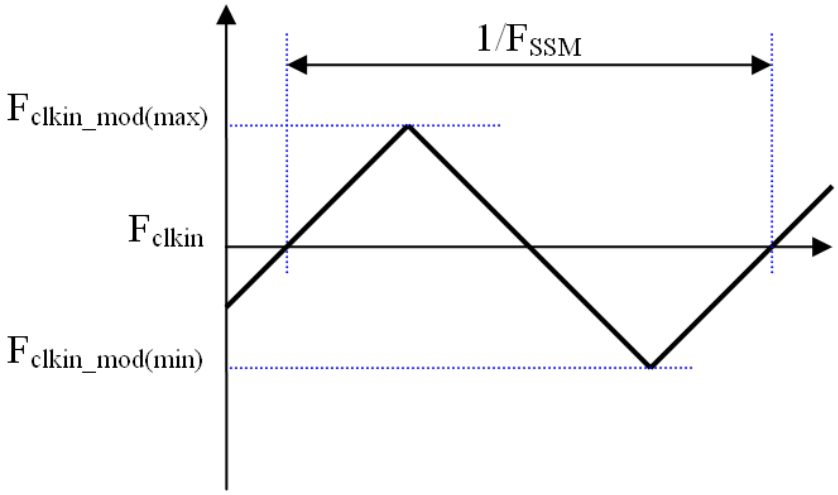
INPUT SIGNAL TIMING DIAGRAM



Note (3) The input clock cycle-to-cycle jitter is defined as below figures. Trcl = I T_1 – TI

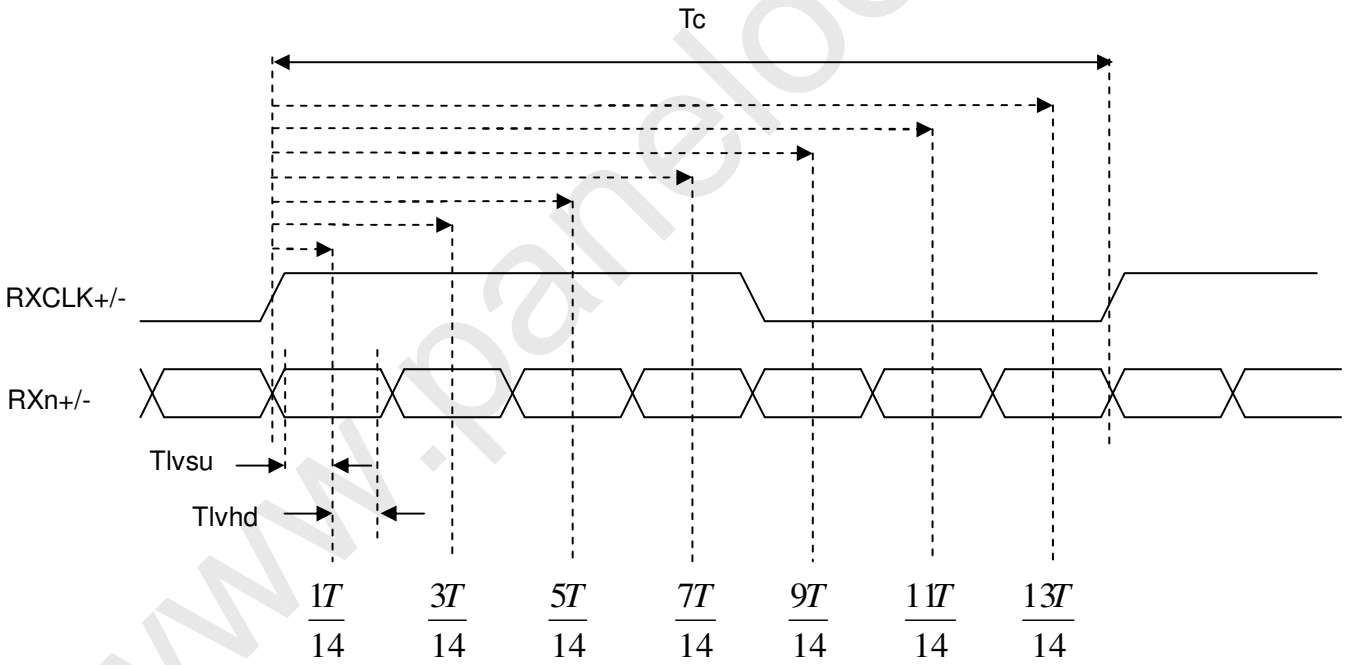


Note (4) The SSCG (Spread spectrum clock generator) is defined as below figures.



Note (5) The LVDS timing diagram and setup/hold time is defined and showing as the following figures.

LVDS RECEIVER INTERFACE TIMING DIAGRAM

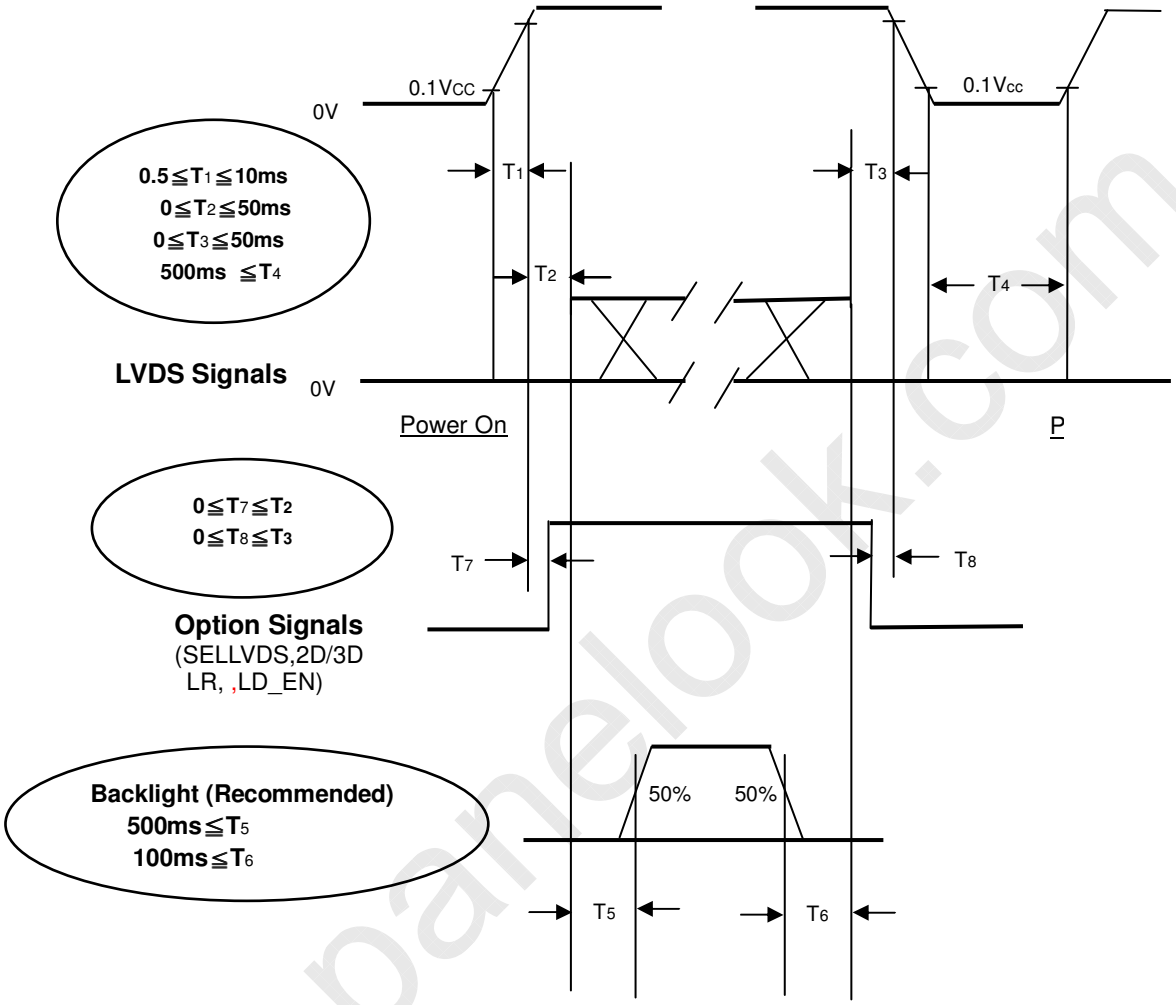


Note (6) Please fix the Vertical timing (Vertical Total =1524 / Display =1080 / Blank = 444) in 3D mode.

6.2 POWER ON/OFF SEQUENCE

(Ta = 25 ± 2 ºC)

To prevent a latch-up or DC operation of LCD module, the power on/off sequence should be as the diagram below.



Power ON/OFF Sequence

Note (1) The supply voltage of the external system for the module input should follow the definition of Vcc.

Note (2) Apply the LED voltage within the LCD operation range. When the backlight turns on before the LCD operation or the LCD turns off before the backlight turns off, the display may momentarily become abnormal screen.

Note (3) In case of Vcc is in off level, please keep the level of input signals on the low or high impedance. If T2<0,that maybe cause electrical overstress failure.

Note (4) T4 should be measured after the module has been fully discharged between power off and on period.

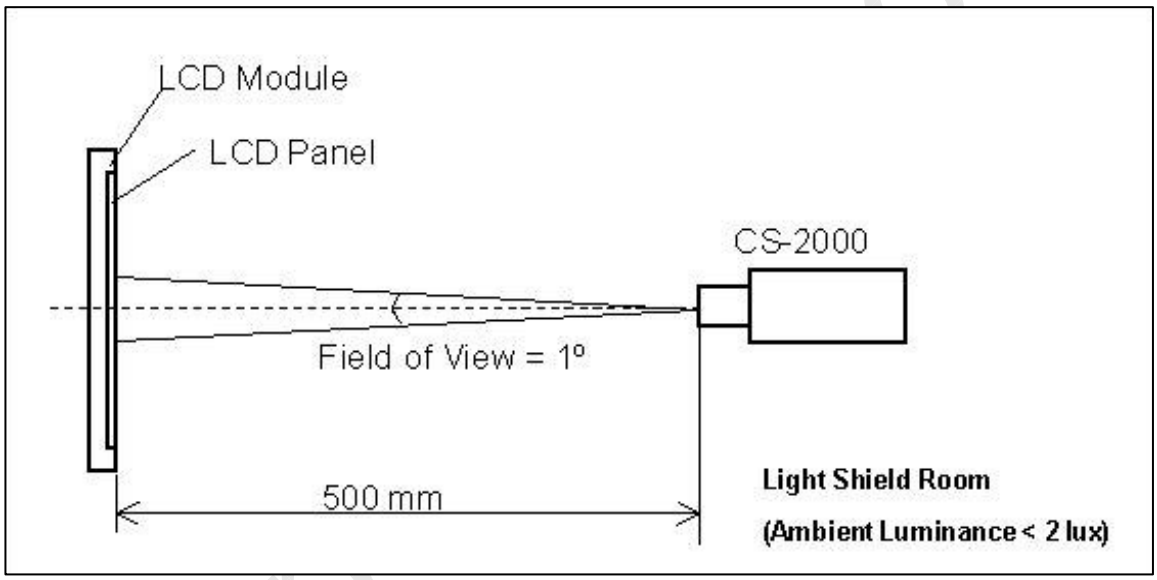
Note (5) Interface signal shall not be kept at high impedance when the power is on.

7. OPTICAL CHARACTERISTICS

7.1 TEST CONDITIONS

Item	Symbol	Value	Unit
Ambient Temperature	Ta	25±2	oC
Ambient Humidity	Ha	50±10	%RH
Supply Voltage	V_{CC}	12	V
Input Signal	According to typical value in "3. ELECTRICAL CHARACTERISTICS"		
LED Current	I_L	130±7.8	mA

The LCD module should be stabilized at given temperature for 1 hour to avoid abrupt temperature change during measuring in a windless room.



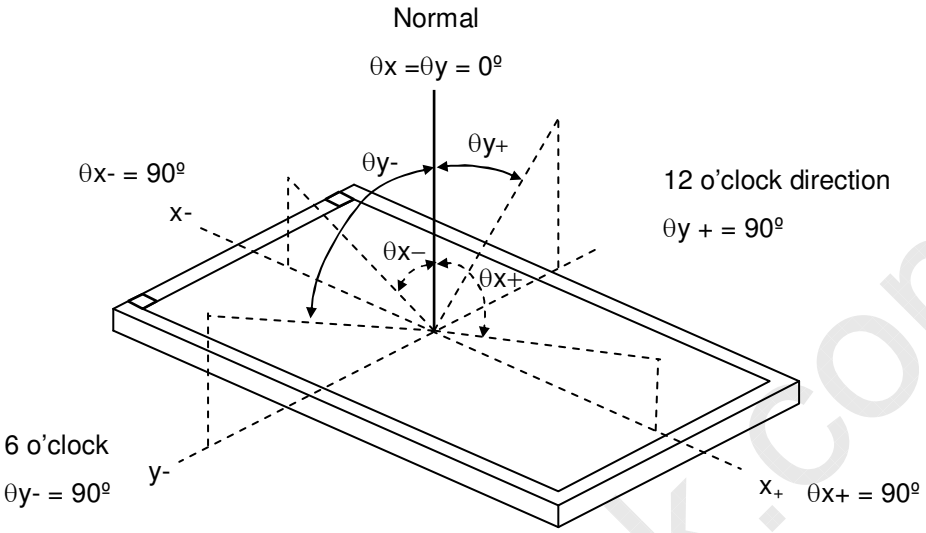
7.2 OPTICAL SPECIFICATIONS

The relative measurement methods of optical characteristics are shown in 7.2. The following items should be measured under the test conditions described in 7.1 and stable environment shown in 7.1.

Item		Symbol	Condition	Min.	Typ.	Max.	Unit	Note
Contrast Ratio		CR	θx=0°, θy =0° Viewing angle at normal direction		(1000)	-	-	(2)
Response Time (TN)		T_R		-	(1.1)	-	ms	(3)
		T_F		-	(3.2)	-	ms	
Center Luminance of White		L_C			(400)	-	cd/m^2	(4)
White Variation		δW		-	-	1.3	-	(6)
Cross Talk		CT		-	-	4	%	(5)
Color Chromaticity	Red	Rx		Typ. -0.03	(0.645)	Typ. +0.03	-	-
		Ry			(0.328)		-	
	Green	Gx			(0.276)		-	
		Gy			(0.637)		-	
	Blue	Bx			(0.154)		-	
		By			(0.052)		-	
	White	Wx			(0.280)		-	
		Wy			(0.290)		-	
	Color Gamut	C.G		-	(72)	-	%	NTSC
Viewing Angle	Horizontal	θx+	CR≥10 (TN)		(80)	-	Deg.	(1)
		θx-			(80)	-		
	Vertical	θY+			(80)	-		
		θY-			(70)	-		

Note (1) Definition of Viewing Angle (θx, θy) :

Viewing angles are measured by Conoscope Cono-80 (or Eldim EZ-Contrast 160R)



Note (2) Definition of Contrast Ratio (CR) :

The contrast ratio can be calculated by the following expression.

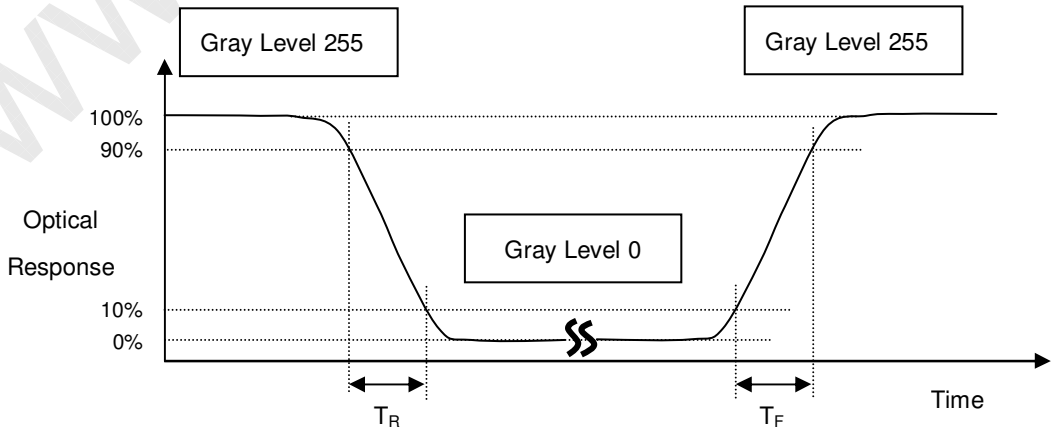
$$\text{Contrast Ratio (CR)} = \frac{\text{Surface Luminance of L255}}{\text{Surface Luminance of L0}}$$

L255: Luminance of gray level 255

L 0: Luminance of gray level 0

CR = CR (5), where CR (X) is corresponding to the Contrast Ratio of the point X at the figure in Note (6).

Note (3) Definition of Response Time (T_R, T_F):



Note (4) Definition of Luminance of White (L_C):

Measure the luminance of gray level 255 at center point and 5 points

L_C = L (5), where L (X) is corresponding to the luminance of the point X at the figure in Note (6).

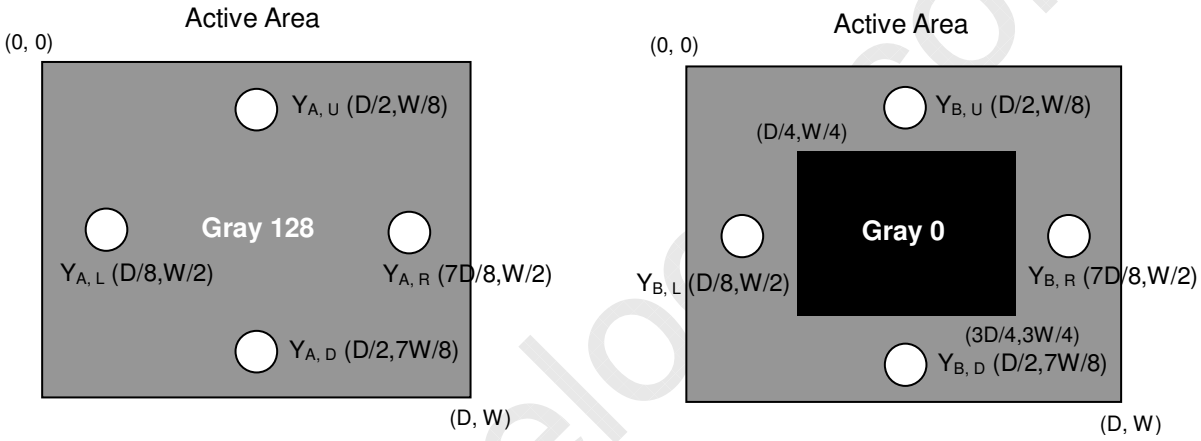
Note (5) Definition of Cross Talk (CT):

$CT = | Y_B - Y_A | / Y_A \times 100$ (%)

Where:

Y_A = Luminance of measured location without gray level 0 pattern (cd/m2)

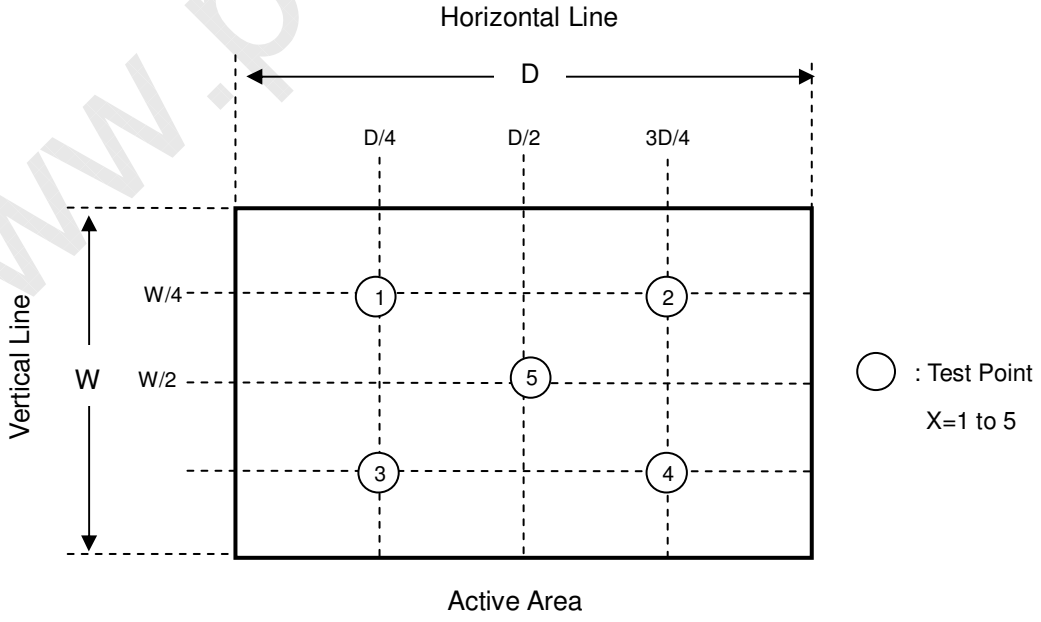
Y_B = Luminance of measured location with gray level 0 pattern (cd/m2)



Note (6) Definition of White Variation (δW):

Measure the luminance of gray level 255 at 5 points

δW = Maximum [L (1), L (2), L (3), L (4), L (5)] / Minimum [L (1), L (2), L (3), L (4), L (5)]



PRECAUTIONS

8.1 ASSEMBLY AND HANDLING PRECAUTIONS

[1] Do not apply rough force such as bending or twisting to the module during assembly.

[2] It is recommended to assemble or to install a module into the user's system in clean working areas. The dust and oil may cause electrical short or worsen the polarizer.

[3] Do not apply pressure or impulse to the module to prevent the damage of LCD panel and Backlight.

[4] Always follow the correct power-on sequence when the LCD module is turned on. This can prevent the damage and latch-up of the CMIS LSI chips.

[5] Bezel of Set can not press or touch the panel surface. It will make light leakage or scrape.

[6] Do not plug in or pull out the I/F connector while the module is in operation.

[7] Do not disassemble the module.

[8] Use a soft dry cloth without chemicals for cleaning, because the surface of polarizer is very soft and easily scratched.

[9] Moisture can easily penetrate into LCD module and may cause the damage during operation.

[10] When storing modules as spares for a long time, the following precaution is necessary.

[10.1] Do not leave the module in high temperature, and high humidity for a long time. It is highly recommended to store the module with temperature from 0 to 35℃ at normal humidity without condensation.

[10.2] The module shall be stored in dark place. Do not store the TFT-LCD module in direct sunlight or fluorescent light.

[11] When ambient temperature is lower than 10ºC, the display quality might be reduced. For example, the response time will become slow, and the starting voltage of CCFL will be higher than that of room temperature.

8.2 SAFETY PRECAUTIONS

[1] The startup voltage of a Backlight is approximately 1000 Volts. It may cause an electrical shock while assembling with the inverter. Do not disassemble the module or insert anything into the Backlight unit.

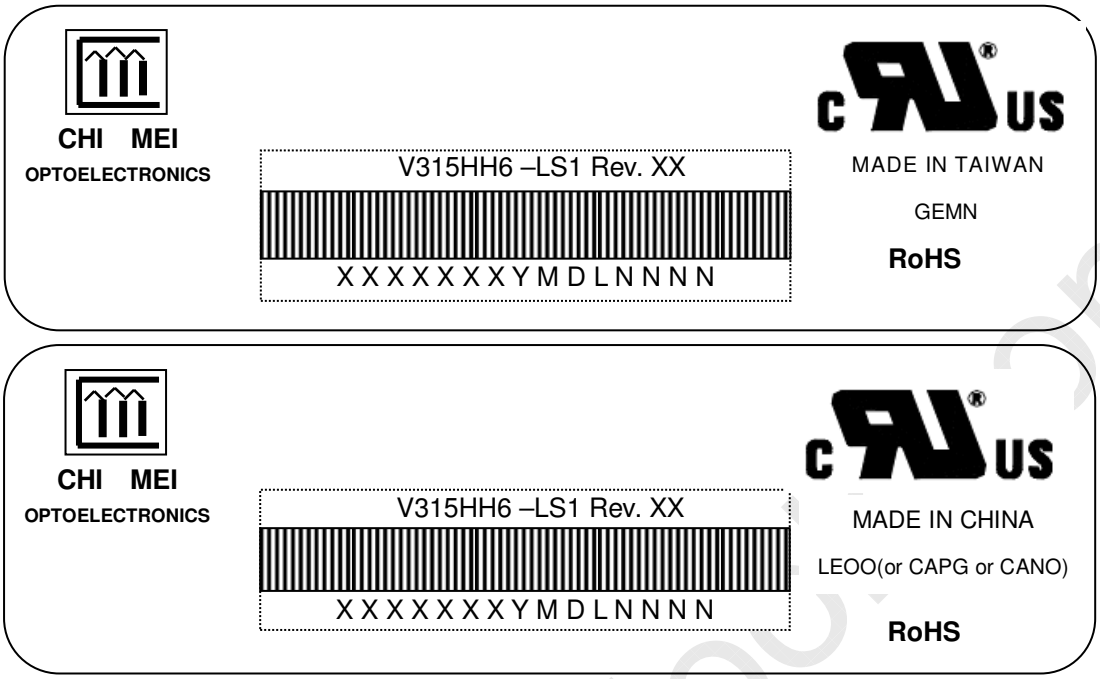
[2] If the liquid crystal material leaks from the panel, it should be kept away from the eyes or mouth. In case of contact with hands, skin or clothes, it has to be washed away thoroughly with soap.

[3] After the module's end of life, it is not harmful in case of normal operation and storage.

9. DEFINITION OF LABELS

9.1 CMI MODULE LABEL

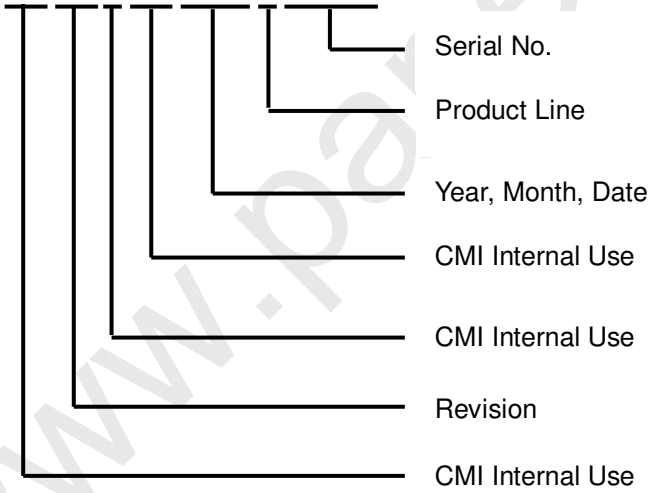
The barcode nameplate is pasted on each module as illustration, and its definitions are as following explanation.



Model Name: V315HH6-LS1

Revision: Rev. XX, for example: A0, A1… B1, B2… or C1, C2…etc.

Serial ID: X X X X X X Y M D L N N N N



Serial ID includes the information as below:

Manufactured Date:

Year : 2001=1, 2002=2, 2003=3, 2004=4…2010=0, 2011=1, 2012=2…

Month: 1~9, A~C, for Jan. ~ Dec.

Day: 1~9, A~Y, for 1st to 31st, exclude I ,O, and U.

Revision Code : Cover all the change

Serial No. : Manufacturing sequence of product

Product Line : 1 → Line1, 2 → Line 2, …etc.

10. PACKAGING

10.1 PACKAGING SPECIFICATIONS

(1) 7 LCD TV modules / 1 Box

(2) Box dimensions : 826(L)x376(W)x540(H)mm

(3) Weight : Approx. 34Kg (7 modules per carton)

10.2 PACKAGING METHOD

Figures 10-1 and 10-2 are the packing method

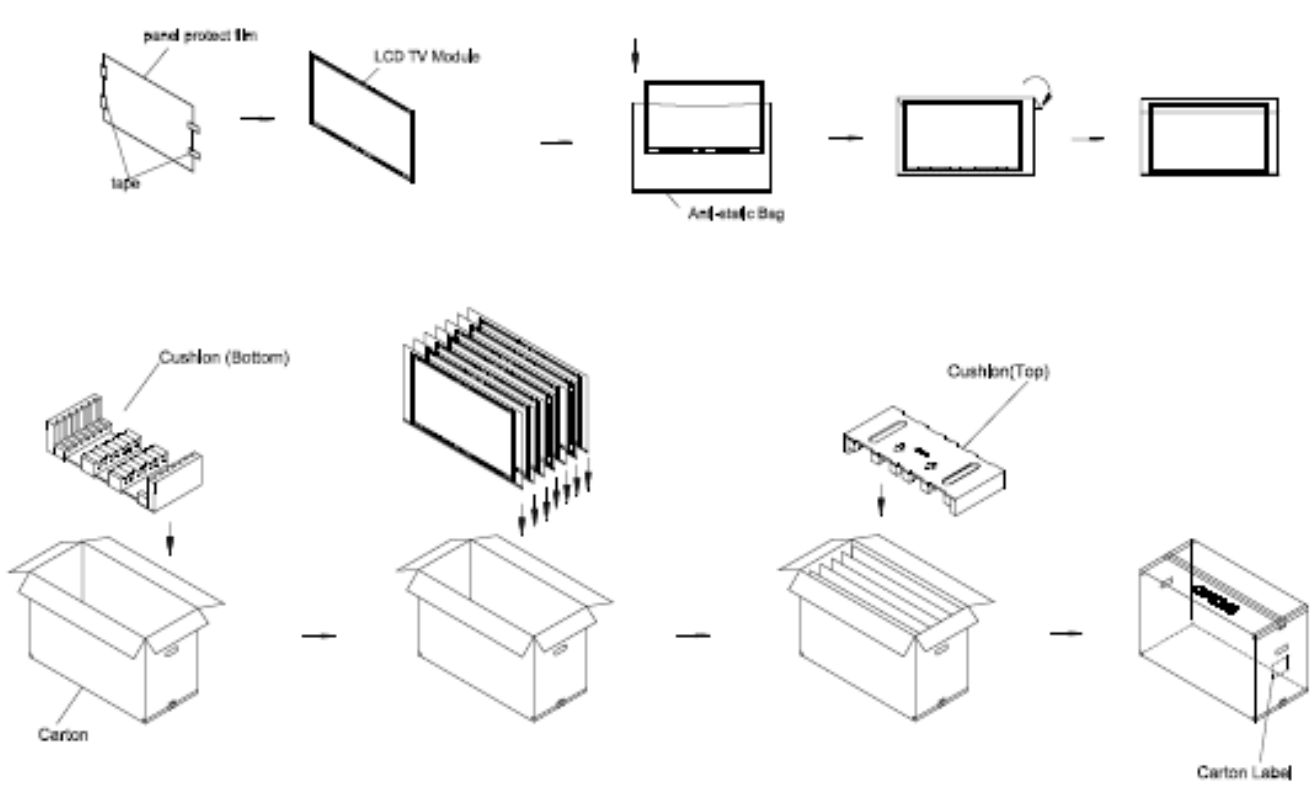
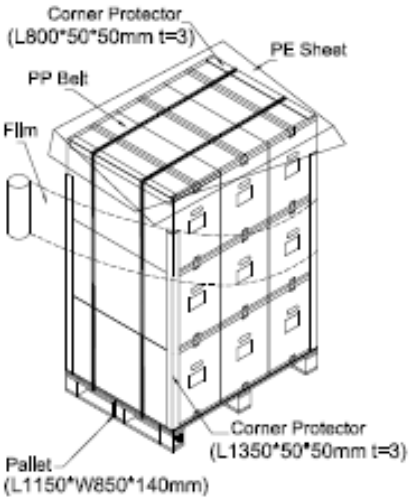
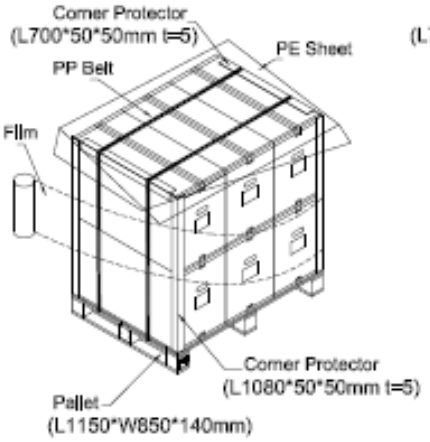


Figure 10-1 packing method

Sea / Land Transportation (40ft Container)



Air Transportation



Sea / Land Transportation (40ft HQ Container)

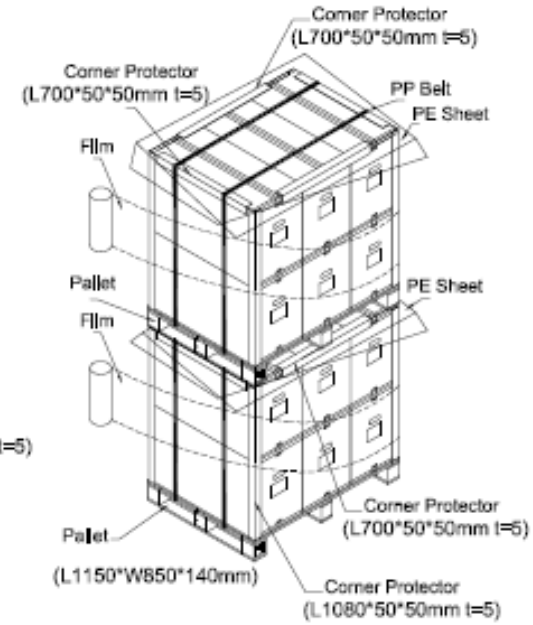


Figure 10-2 packing method

11. MECHANICAL CHARACTERISTIC